



National Transportation Safety Board Aviation Accident Final Report

Location:	LUMMI ISLAND, WA	Accident Number:	SEA01FA001
Date & Time:	10/09/2000, 0951 PDT	Registration:	N941FE
Aircraft:	Cessna 208B	Aircraft Damage:	Substantial
Defining Event:		Injuries:	1 Fatal
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

With a reported ceiling of 500 feet and visibility of 2 miles, the pilot requested and received a Special Visual Flight Rules (VFR) clearance to depart the Bellingham airport. He then took off and called clear of Bellingham's Class D airspace. A witness reported seeing the aircraft flying very low over water near the accident site, appearing to go in and out of clouds, and subsequently seeing it turn toward rising wooded terrain and disappear into the clouds. The aircraft crashed shortly thereafter. Witnesses reported very low ceilings and fog in the accident area at the time. Pieces of the aircraft's left wing and left horizontal stabilizer, along with a felled treetop, were found between the location of the witness's sighting and the main crash site, on or near the crest of a hill about 1/4 mile from the main crash site. These pieces exhibited leading-edge and primary structure damage, and leading-edge-embedded plant material, consistent with the pieces separating from the aircraft upon contact with trees. Wreckage and impact signatures at the main crash site were indicative of an uncontrolled impact with the ground. Investigators found no evidence of any aircraft malfunctions or cargo anomalies occurring prior to the apparent tree strikes.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's attempted flight into known adverse weather conditions, and his subsequent failure to maintain altitude above, or clearance with, trees. Factors contributing to the accident included low ceilings, fog, the pilot's low-altitude flight, rising terrain, and trees.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: MANEUVERING

Findings

1. (F) WEATHER CONDITION - LOW CEILING
2. (F) WEATHER CONDITION - FOG
3. (C) FLIGHT INTO KNOWN ADVERSE WEATHER - ATTEMPTED - PILOT IN COMMAND
4. (F) ALTITUDE - LOW - PILOT IN COMMAND
5. (F) TERRAIN CONDITION - RISING
6. (F) OBJECT - TREE(S)
7. (C) ALTITUDE/CLEARANCE - NOT MAINTAINED - PILOT IN COMMAND

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: MANEUVERING

Findings

8. WING, WINGTIP - SEPARATION
9. FLIGHT CONTROL, AILERON - SEPARATION
10. HORIZONTAL STABILIZER SURFACE - SEPARATION

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

HISTORY OF FLIGHT

On October 9, 2000, approximately 0951 Pacific daylight time, a Cessna 208B, N941FE, operating as Empire Airlines flight 665 on a 14 CFR 135 non-scheduled domestic air cargo flight, crashed in wooded terrain near the northwest end of Lummi Island, Washington. The aircraft, which was owned by Federal Express Corporation (FedEx) and carrying FedEx cargo at the time, was substantially damaged, and the airline transport pilot-in-command (who held commercial privileges for single-engine land airplanes), the airplane's sole occupant, was fatally injured. The flight had departed Bellingham, Washington, on a special visual flight rules (Special VFR) air traffic control (ATC) clearance approximately 8 minutes prior to the accident, bound for Orcas Island Airport, Eastsound, Washington. Instrument meteorological conditions (ceiling 500 feet broken, 2 miles visibility in mist) were reported at Bellingham (approximately 8 nautical miles northeast of the crash site) at 0942 and 0953, and the FAA reported no record of a flight plan being filed for the flight.

Personnel from the Bellingham FedEx station stated that the flight's target departure time was about 0930. The flight's loading manifest indicated that 1,110 pounds of cargo were aboard for the accident flight, with no dangerous goods. The operator reported that the pilot obtained weather information at the Bellingham FedEx station prior to departure, and that the flight took off with about 1,000 pounds of Jet A fuel on board. Empire Airlines' chief pilot stated to the NTSB investigator-in-charge (IIC) that the Bellingham to Orcas Island flight is a visual flight rules (VFR) leg, since there is no published instrument approach procedure into Orcas Island Airport.

Review of a re-recording of the flight's communications with the Bellingham air traffic control tower (ATCT) disclosed that about 0940, the pilot asked the tower for the ceiling and visibility. The tower controller replied that the ceiling was 500 feet broken and visibility was 2 to 2 1/2 miles. At 1642, the pilot requested taxi, and clearance out of the Bellingham Class D airspace to the west. The tower cleared the pilot to taxi to runway 16, and issued a Special VFR clearance to exit the Class D airspace to the southwest at or below 2,000 feet. The tower controller also instructed the pilot to report leaving the Class D surface area to the southwest. The flight was cleared for takeoff about 0943:00. About 0946:20, the pilot reported leaving the Class D airspace to the southwest. The tower asked the pilot, "how's it look?" The pilot replied that the weather was "scuddy", with ceiling 500 feet and visibility 2 to 2 1/2 miles "as reported", with weather "lower in other areas but about the same."

Following the aircraft's takeoff from Bellingham, the approach control radar at Vancouver, British Columbia, Canada, recorded a 1200 beacon code on a southerly track from the airport to the shoreline of Bellingham Bay, then turning onto a southwesterly track to a point over Bellingham Bay approximately 3 nautical miles southwest of the airport, at which point radar contact was lost. The target's pressure altitude at the last point of radar contact was 600 feet.

A witness reported that while waiting at the Lummi Island ferry terminal (on the east side of the island), he observed the accident airplane flying in a generally south-to-north direction up Hale Passage (between Lummi Island and the mainland) at very low altitude, which he estimated as 50 to 100 feet above the water, and just below the clouds. The witness stated that the airplane appeared to him to be flying very fast, and to be going in and out of the clouds. The witness reported that the airplane subsequently turned to the west (generally in the

direction of Orcas Island), at a point that appeared to him to be prior to reaching the northwest end of the island. The witness stated that the aircraft then disappeared into the weather; he estimated that the aircraft was 1 mile away from him when it disappeared. The witness reported that the aircraft never climbed, and that the cloud deck was in the trees. He further indicated that he observed no signs of any malfunction (such as smoke, fire, or pieces falling off of the aircraft), that the aircraft sounded to him like a normal turboprop-powered airplane, and that the aircraft appeared to him to be under control during the whole time he observed it (about 20 seconds.)

Seven other witnesses on the island gave statements in which they reported hearing a low-flying aircraft, and/or the sound of a crash, at about the accident time. Only one of these reported actually seeing the plane; this witness stated that the aircraft was "barely visible in the fog." One couple, who reported hearing the aircraft pass near their home near the crash site and subsequently hearing it crash nearby, both reported they heard the engine sputter a few seconds before the sound of impact. Another witness reported that he did not hear any engine noise, only the sound of impact. The remaining four witnesses reported the engine noise as "full bore", "cruising power (strong and regular)", or an RPM change "as if the pilot was applying climb power" with the engine RPM appearing "higher than normal"; or that they did not note any pops, bangs, or sputtering. Five of the witnesses noted the low ceiling and visibility, or "extra dense" fog in the area, with ceiling estimates ranging from 100 to 200 feet and visibility estimates ranging from 100 feet to "1 1/2 blocks."

An emergency call was received by local dispatch at 0951, reporting that an aircraft was down on Lummi Island.

The accident occurred during daylight hours. The coordinates of the main crash site were approximately 48 degrees 44.1 minutes North latitude and 122 degrees 42.8 minutes West longitude.

METEOROLOGICAL INFORMATION

A Meteorological Factual Report on the accident (attached) was prepared by a meteorological specialist of the NTSB Operational Factors Division, Washington, D.C. This report indicated that at 0800 on October 9, a cold front extended from a weak low pressure center over south central Washington northeastward through central Washington into British Columbia, Canada. A trough of low pressure also extended along the Oregon-Washington coastline to the Strait of Juan de Fuca.

The aviation area forecast (FA) amendment issued at 0600 on October 9, valid during the accident time frame, forecast the conditions for the coastal sections of the Washington Cascades westward as: broken 1,000 to 2,000 feet; overcast 5,000 feet; layered up to flight level (FL) 220; occasional visibility 3 to 5 miles in light rain and mist; isolated embedded thunderstorms and light rain showers with cumulonimbus tops FL 300; and outlook as being for marginal visual flight rules conditions due to ceiling, rain showers and mist. AIRMET SIERRA Update 2 for IFR and mountain obscuration, issued at 0645 on October 9 and valid for the accident time frame, advised of occasional ceiling below 1,000 feet and visibility below 3 miles in mist in the accident area. The terminal aerodrome forecast (TAF) for Bellingham, issued at 0433 on October 9 and valid during the accident time frame, forecast conditions there for the accident time frame as: calm winds, visibility 3 miles in light rain, scattered clouds at 600 feet; ceiling 1,500 feet broken; overcast at 3,500 feet; with temporary conditions of

visibility 1 mile in light rain; ceiling 200 feet broken; broken clouds at 600 feet; and overcast at 1,500 feet.

Bellingham was the closest meteorological observation facility to the accident site. A special meteorological observation (SPECI) taken at Bellingham at 0942 and a METAR observation taken there at 0953 reported the same conditions, except for a change in wind direction from 290 degrees (at 0942) to 310 degrees (at 0953). Both otherwise gave conditions as: wind speed 6 knots; visibility 2 miles in mist; ceiling 500 feet broken; broken clouds at 6,000 feet; overcast at 8,000 feet; temperature 12 degrees C; dewpoint 12 degrees C; and altimeter setting 29.74 inches Hg.

Further details on the meteorological conditions that existed at the time of the accident are presented in the NTSB Meteorological Factual Report.

FLIGHT RECORDERS

The accident airplane was not equipped, nor was it required to be equipped, with a cockpit voice recorder (CVR) or flight data recorder (FDR). However, it was equipped with a Power Analyzing Recorder (PAR) manufactured by Avionics Specialties Inc. of Earlysville, Virginia. This unit recorded various engine operation parameters in a non-volatile memory for maintenance purposes. The PAR was located and removed from the accident aircraft at the accident scene, and sent to the facilities of its manufacturer in Earlysville for readout under the supervision of a flight recorder specialist from the NTSB Vehicle Recorders Division, Washington, D.C. Readout of the unit, conducted on October 30, 2000, disclosed a "system reset" consistent with the time of the accident that indicated engine operating parameters at the time of the accident as: inter-turbine temperature (ITT) 644 degrees C; torque 1,373 foot-pounds; gas generator RPM (Ng) 92.9%; propeller RPM (Np) 1,895 RPM; fuel flow 358 pounds per hour; pressure altitude 1,608 feet; indicated airspeed 135 knots; and outside air temperature 10 degrees C.

The values of ITT, torque, Ng, Np, and indicated airspeed recorded at system reset were all noted to be within, and toward the high end of, their respective normal operating ranges as per the Limitations section of the Cessna 208 Caravan I Information Manual (for Airplanes with PT6A-114 [600 SHP] Engine) (excerpts attached). Additionally, the Performance section of the Caravan I Information Manual (excerpt attached) indicates a fuel flow of 350 pounds per hour and true airspeed of 151 knots under the following conditions: cargo pod installed; pressure altitude 2,000 feet; gross weight 8,000 pounds; inertial separator-normal; Np 1,900 RPM; temperature 10 degrees C; and torque 1,345 foot-pounds (the recommended torque setting for best range in zero-wind conditions at this combination of altitude, Np and temperature, per notes accompanying the performance charts.)

WRECKAGE

Investigators from the NTSB, FAA, Cessna Aircraft Company, Pratt & Whitney Canada, FedEx, and Empire Airlines responded to the accident scene and performed an on-scene examination of the aircraft wreckage from October 9 to October 12, 2000. The aircraft had crashed into wooded terrain near the northwest end of Lummi Island. The accident site was to the west of an east/west-oriented pair of wooded hills that rose to a peak elevation of 362 feet above sea level. Trees in the area extended to an estimated height of 100 feet above ground level (AGL) or greater. The main wreckage site elevation, according to Global Positioning System (GPS) readings, was approximately 220 feet above sea level.

The main aircraft wreckage, consisting essentially of the complete aircraft less both wings outboard of the flaps and an outboard portion of the left horizontal stabilizer, had come to rest inverted and headed generally southeast, with its nose against the base of a set of trees. A portion of the aircraft's left wing was located in the top of a tree near the main wreckage, and the complete right wing section outboard of the flap was located in the base of a set of trees about 30 feet northeast of the main wreckage. Several treetops were also broken off adjacent to the main wreckage. The line of sight from the main wreckage up to the detached left wing section in the treetop made an angle of 55 degrees above horizontal, and the sight lines from the main wreckage up to the broken tree tops made angles between 38 and 45 degrees above horizontal. When investigators gained access to the detached left wing section, they found that the section was missing approximately the outboard 33 inches of the wing and aileron. The missing outboard section of left wing and aileron was not found during the on-scene examination. Investigators found no evidence of any aircraft systems malfunctions, or of fire, during the on-scene examination. Examination of the aircraft's cargo disclosed no discrepancies or anomalies with the cargo, and no evidence of undeclared dangerous goods. A strong odor of jet fuel was noted at the accident site.

An approximately 29-inch-long piece of aircraft structure was reported found by a local resident on October 21, 2000. The local resident, who retrieved the piece at the NTSB's request and turned it over to the NTSB for examination, reported that he found the section on the crest of a hill approximately 1/4 mile northeast of the aircraft crash site. This section was identified by part number markings and visual comparison with drawings in the Cessna 208 Illustrated Parts Catalog (IPC) as the outboard section of the left horizontal stabilizer. The section was missing the elevator except for the outboard elevator hinge elevator attach brackets, which were still attached to the outboard elevator hinge and rotated freely. (NOTE: The complete left elevator, part of which remained attached to the remaining horizontal stabilizer and part of which was detached, was found with the main aircraft wreckage at the accident site.) The section had an approximately 2 3/4-inch diameter, semicircular indentation in the leading edge approximately 21 inches inboard of the stabilizer tip, and the section overall was severely accorded along the stabilizer chord line and bent forward 90 degrees at the location of this indentation. The individual who found the part reported that an approximately 10-foot-long section of felled cedar tree top was also found about 16 feet north of the stabilizer section. The trunk of the felled treetop section was approximately 2 3/4 inches in diameter.

The same local resident who reported finding the left horizontal stabilizer section and turned it over to the NTSB subsequently reported, on November 27, 2000, that he had located the missing outboard section of left wing and aileron. The resident reported that he located this component about 400 feet east of where he had found the left horizontal stabilizer section and felled treetop. At the NTSB's request, this individual retrieved the section and turned it over to the NTSB for examination. The section was identified by part number markings and visual comparison with drawings in the Cessna 208 IPC as the left wingtip and outboard aileron section of the aircraft. The section measured about 29 inches spanwise from the fracture face to the outboard rib, and about 30 inches from the fracture face to the most outboard point of the wingtip fairing. The wingtip navigation light and strobe were in place. The outboard left aileron and trim tab section, measuring about 32 inches spanwise, remained attached to the wingtip section at the outboard aileron hinge. One small piece of the inboard portion of this aileron section was detached; the resident reported that this piece was found about 100 feet

south of the wingtip section. This piece was bent double in like manner to severe accordion deformation observed at the wing fracture face. The wingtip section had a major indentation into the leading edge. This indentation extended about 19 inches back into the wing chord, and was rounded (approximately 5 inches radius, concave forward) at its aft end. The wingtip section was severely accorded in a chordwise direction along the entire fracture surface. The wing spars were bent almost straight aft at the fracture face. Plant material was found embedded into rips in the skin on the aft side of the rips.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy on the pilot was performed by the Whatcom County Medical Examiner, Bellingham, Washington, on October 11, 2000. The medical examiner determined the cause of the pilot's death to be "Massive blunt trauma."

Toxicology tests on the pilot were performed by the FAA Civil Aeromedical Institute (CAMI), Oklahoma City, Oklahoma. The CAMI toxicology tests screened for ethanol and drugs and detected none. Carbon monoxide and cyanide tests were not performed.

TESTS AND RESEARCH

A disassembly examination of the aircraft's Pratt & Whitney Canada PT6A-114 turboprop engine was conducted by a Pratt & Whitney Canada investigator, under the supervision of the NTSB investigator-in-charge, at the facilities of Alpha Aviation in Bellingham on October 13, 2000. Pratt & Whitney Canada's report of this examination (Pratt & Whitney Canada Report No. TL-1619, dated December 20, 2000, text attached) concluded: "The engine displayed rotational signatures to its internal components characteristic of the engine developing power at impact in a middle to high power range." The Pratt & Whitney Canada report further concluded that "The engine displayed no indications of any pre-impact anomalies that would have precluded normal operation prior to impact."

Sections of the aircraft's left wing and aileron, comprising approximately wing station (WS) 258 to WS 277 (the most outboard left wing fracture face found at the main crash site, i.e., the mating fracture face to the detached left wingtip and aileron section), were sent to the NTSB Materials Laboratory in Washington, D.C., for metallurgical examination of the fracture surfaces. The Materials Laboratory's factual report of this examination (Report No. 01-038, attached) stated:

...General deformation of the spar and skin adjacent to the fracture surfaces was consistent with the outboard sections of the wing and aileron...moving aft relative to the inboard sections. Fracture surfaces on the structural components were...consistent with overstress separation. No evidence of a preexisting crack was observed. Some wood splinters were observed around several pan head screws on the lower, forward side of the wing.

ADDITIONAL INFORMATION

Following examination by FAA Civil Aviation Security Division and Federal Express investigators, the aircraft cargo was released to Mr. Michael J. Graham, senior security specialist for Federal Express Corporation, Bellevue, Washington, for disposition on October 12, 2000. Final release of the aircraft wreckage was made to Mr. William Garcia, branch manager/surveyor, Airclaims, Inc., Seattle, Washington, on May 4, 2001. Airclaims is an insurance adjuster firm representing Federal Express. As of the date this report was

submitted, Mr. Garcia had not acknowledged final release of the aircraft wreckage.

Additional Persons Participating in this Accident Investigation (continued):

Tom Strom Empire Airlines Coeur d'Alene, ID 83814

Pilot Information

Certificate:	Airline Transport; Commercial	Age:	67, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	Glider	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane Single-engine; Instrument Airplane	Toxicology Performed:	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	Last FAA Medical Exam:	03/15/2000
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	8705 hours (Total, all aircraft), 4500 hours (Total, this make and model), 7900 hours (Pilot In Command, all aircraft), 107 hours (Last 90 days, all aircraft), 18 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N941FE
Model/Series:	208B 208B	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	208B0192
Landing Gear Type:	Tricycle	Seats:	2
Date/Type of Last Inspection:	09/14/2000, AAIP	Certified Max Gross Wt.:	8750 lbs
Time Since Last Inspection:	34 Hours	Engines:	1 Turbo Prop
Airframe Total Time:	3526 Hours	Engine Manufacturer:	P&W
ELT:	Installed, not activated	Engine Model/Series:	PT6A-114
Registered Owner:	FEDERAL EXPRESS CORP.	Rated Power:	600 hp
Operator:	EMPIRE AIRLINES INC.	Operating Certificate(s) Held:	Supplemental; On-demand Air Taxi (135)
Operator Does Business As:		Operator Designator Code:	COEA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	Condition of Light:	Day
Observation Facility, Elevation:	BLI, 170 ft msl	Distance from Accident Site:	8 Nautical Miles
Observation Time:	0953 PDT	Direction from Accident Site:	40°
Lowest Cloud Condition:	Unknown / 0 ft agl	Visibility	2 Miles
Lowest Ceiling:	Broken / 500 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	6 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	290°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	54° C / 54° C
Precipitation and Obscuration:			
Departure Point:	BELLINGHAM, WA (BLI)	Type of Flight Plan Filed:	None
Destination:	EASTSOUND, WA (ORS)	Type of Clearance:	None
Departure Time:	0943 PDT	Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	GREGG NESEMEIER	Report Date:	09/19/2001
Additional Participating Persons:	DAVID A MAY; RENTON, WA TOMMY L MOODY; WICHITA, KS THOMAS A BERTHE; S. BURLINGTON, VT ALAN W RAY; MEMPHIS, TN		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).